Menlo Park Notebook #106 [N-80-09-28]

This notebook covers the period September 1880-March 1881. Most of the entries are by Charles Batchelor and Alex Welsh. There are also entries by Edison, Francis Upton, and W. A. Mills. The material all relates to the development of the electric lamp and consists primarily of notes and tables relating to lamps that were apparently made at the lamp factory and tested at the laboratory. Included are tests of lamps, made on vacuum pumps during September and October 1880, and resistance tests of lamps for the period November 1880-January 1881. There are also drawings of lamps and vacuum pumps, entries relating to carbon experiments, and a memorandum by Batchelor of things "to be attended to immediately" at the lamp factory. The label on the front cover is marked "Gedney." The book contains 284 numbered pages.

Blank pages not filmed: 54-55, 82-83, 156-187, 190-191, 194-199, 202-203, 206-213, 232-265, 272-275, 278-279.

Missing page numbers: 147-148, 281-282.

Explanatory Marks

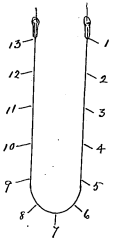
Beginning Dec. 1

: Sent to Edison for experiment.
o Broken in handling by US.

FROM
(WILLIAMS & PLUM)
Dealers in Stationery
AND
Blank Book Manufacturers
777 Broad St., Newark

Sept 28th 1880 1

Carbon loop – marked for showing position of faults —



Experiments on pumps. Sept 20 1880 3

1 = Has contraction 2 mm
Inside fall tube 5 mm
Outside " " 9 mm
Runs through $14\frac{1}{2}$ lb Hg per min —
Contraction in this is twisted so that the Hg strikes the cross tube —

This cracked with the pounding of the mercury on the 6th Lamp.

Pumps. Sept 28th 1880

No 2		No 3	
Contraction	1·5 mm	Contraction	1·5 mm
inside tube	4 mm	inside tube	4 mm
outside tube	7 mm	outside tube	7 mm
Runs through per min	11 $\frac{1}{4}$	Runs through per min	15

(Remark: the contractions of these cannot be right as lie well)
(Take pieces of tubing for contractions)

4.		5	
Contraction made from tubing with hole 1/4 in Coeg	1·5 mm	Contraction made from tubing hole 1/8 in Coeg.	2 · mm
fall tube inside	3·5	inside of fall tube	4
outside fall tube.	9	Outside of tube	7
Mim. Hg.	17 1/2	Per min –	23 3/4 cc.

Pumps. Sept 29th 1880.

6	7.
Hand made Contraction	
2 mm	
Inside fall tube 4	
Outside fall tube 4	
per min Hg. 19 3/4	
This only run one lamp and fall tube cracked	
Mercury splashed very much after leaving the Contraction	

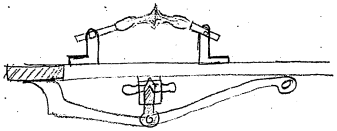
Oil testers —

1890 Sept. 29	30	Oct 1	2	4	5	6	7	8	9
Good 16	24	64	11	41	28				41
Bad Spots at									
Bright on one side 2	1	6-9-11 7-9-12 6-7-10-11 8-6-12	8		4				3. 12. 4
Bright in middle 1	1	3.7.12 3.6.12 6.8.12.13 —12—	1		3				3
Spots like a Clump	1 3	6.8.11. 6.12. 5.8. 2.8.11	1		6				8
Bubs in Handling 2	1	—12— 6 3.12. 2.8 12.	1		2				3
Spots in glove		8.13. 3.13.							
Bad's sent over		3. 1.7.12. 9.6.12.							
		6.8. 2. 2.6. 2 6-8.							
		8.9.12.							

Pumps	Sept 29	30	Oct 1st	2	45	6	7	8	9	11	12
Good	26	20	11	25		14	18	15		12	11
Bad Sets				1							
Leadbrum				1							
Too Bright											
Too Dull			1							1	
Threw Blue all over											
Small Blue aces.										1	
Busted in pumps	2			1			1			1	1
Leak in Glass				1						1	1
Broke in handling	1	1	1			1		1		1	
Split in Clamp	10	7	6	5		3	5	5		11	9
Bent over				1							
Broke by Hg running up										1	1
Total											

Including Oct 1st

1 ~~||||~~	6
2 ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ |||	23
3 ~~||||~~ ||	7
4					5
5 ~~||||~~	5
6 ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ||||	24
7 ~~||||~~ ~~||||~~ ~~||||~~	15
8 ~~||||~~ ~~||||~~	11
9 ~~||||~~ ||	7
10 ~~||||~~ ||	7
11					4
12 ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~	21
13 ~~||||~~ ~~||||~~ |||	13



Lots of lamps as sent up to the Laboratory

Sept 20

Lot 1. Lo Consist of 159 lamps of Fibres generally not picked but made from the fishing poles we have bought

	Sent
Sept 27.	47
29	20
30	30
Oct 4	30
5	20
	159

Lot No 2.
Lo Consist of
Carbons made from Bamboo brought by Moore from Newport Sept 29th 1880 bought of Selton 124 W 3 St
Poles were 8 & 9 ft long.
Joints were 8 & 12 in long for whole length of pole
Diameter about 1 3/8

Color Ripe and Yellow ——
Moderately thin shell ——
very hard surface ——
very Clear and smooth inside
the bamboo ——
Said to be of Chinese wild
growth ——
Sent Oct 4 —— 38

Lot No 3

Same as lot No 2 only whilst they were in the pumps they were brought up to 70 candles for 2 or 3 seconds

Sent up Oct

Lot No 4

List of different pumps

1	2	3
Inside $3\frac{1}{2}$ mm	— $3\frac{1}{2}$ mm	— $3\frac{1}{2}$ m
Outside $6\frac{1}{2}$ m	— $11\frac{1}{2}$	— $6\frac{1}{2}$
Pumps in Vacuum } - 10 inch	Contract. $1\frac{1}{2}$	Cont
from Contractor	Pumps	Pumps $7\frac{1}{2}$
Taken off	7 lamps	3 lamps
~~Broke straight~~	Broke straight	Broke in
~~Crews~~	crews fall tube	night on the
~~Fell off~~	at night	gauge

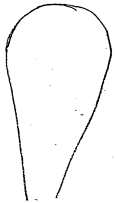
4	5	6	7	8
Inside $3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$
Out 11	11	11	11	11
Cent $1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
Pounds $13\frac{1}{2}$	$12\frac{1}{2}$	10	$10\frac{3}{4}$	$12\frac{1}{4}$
6 Stamps Rusko in insid in Feed Tube				

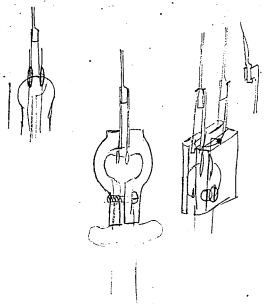
	9	10	11	12	13
Inside diam	3½	3½	3½	3½	3½
Outside diam	6	14	11	11	7
Contraction	2	1½	1½	1½	2
Pounds from cross-glass	7	10½	9½	12½	8

	14	15	16	17	18	19	20
Inside	3½	3½	3½	3½	3½	3½	3½
Outside	7	8½	11	6½	6½	10	10
Contraction	2	2	1½	old	old	3½	1½
Pounds	6	11¾	11¾	6	8	6	11½

	21	22	23	24	25	26
Inside	3½	3½	3½	3½	3½	3½
Outside	10	6½	6½	10	6½	6½
Contraction	1½	old	old	1½	old	old
Pounds.	13½	9	this has got larger fall tube half way down 9	12	5½	Pounds
						This fall tube opens out 4 above ⅛ inside at 1/2 way down

27	28	29	30
Inside 3½	Inside 3½		
Outside 6	11		
Cart. old	Cart. 1½		
Short fall tube	Rubber tube or fall tube		
Pounds	Pounds		





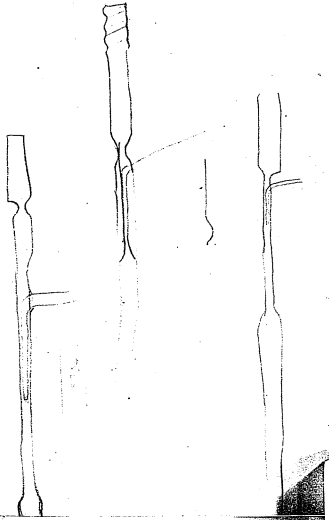
Dr Teeters

Oct

	12	13	14	27	28			
Good	64	15	19.	23	31			
Shots	2. 11 2. 12 6. 5 9. 13. 3 2 2 3 1 1. 3. 2 13. 1 2 1 2 1 all shots	12 1 1. 12. 2 all shots	8 1 G.F.	11 2 12. 11. 3 all shots	6. 2. 1. 13. 8 2 11. 5. 10 2 3 5 11. 13. 7.			
Bright on side	3			2				
Bright Middle	1	1	1					
Shot Clump.	13	8	1	2	2			
Handling	6	1	1	1	2			
Shot fire								
Bent			1					
Refusing				1	3.			

Pumps Creek

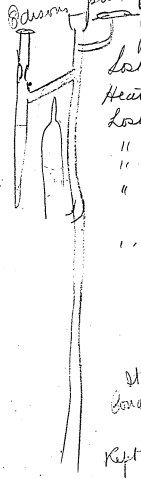
	13	14												
Good	4	20												
Short														
Low pressure														
Too bright														
Too dull														
Pilot all out														
Pilot dire														
Renewed	6	2												
Leak Stove	1	1												
Hairline	2													
Short Length														
Bad														
Hy.	1													



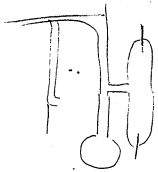
Oct 19th 1880

Tests on a Camp on Thos

Dawson pump time 2·18



Just beginning to run along	2·32
Lost spark at (grease oil 4 cells)	3·46
Heated up for instant	3-52
Lost spark Heated again	4·05
" " " "	4·09
" " " "	4·10
" " " "	4·12
	4·14
	4·17
" " " "	4 18
	4-19
	4-20
	4 20
a little low-n	4·20
	4-21
	4-21
	4 22
It now has to go through	4-27
longer pipes before it comes	4·26
	4·30
	4-31
Kept on half min —	4-34

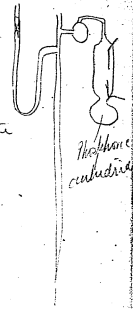


4 37 Kept on half min
4 39 Kept on 1 min
Took off the coil to put on
other pump
4'40 Water for ¼ hour
4 55. No spark when heated
5 o'clock Kept the lamp at
high heat 20 minutes and no
spark
5'10 Sparks occasionally
5 15 Current on and no spark
for 20 minutes.
Scalded off and sent
up to Francis
This we make model
Contraction .020
tube .090

New pump with drying tube

Piston 44 D

445 $\frac{1}{8}$ in along wire
447 all along wire
448 all over tube
4·49 from Blued to Reddish
4·54 Red on muffle & blue on other



To be attended to immediately

Put up the wine cask for tank

Make lead lined chamber for dipping

Make tank wood for same

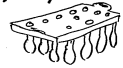
Make Hood and Chimney for same.

Make tank for sprays.

Make tank for water bath.

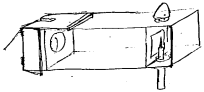
Make 12 lamp holders for dipping

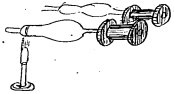
Make racks for drying and holding lamps



Have Winans connect barrel and pump to cistern —

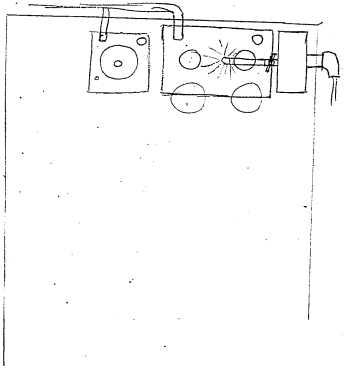
Butts make spray and flow off water pipe from all tanks.





Carbonization

Fibre	No in Box	No in bad bag	2 7/16	2 15/32	2 1/2	2 17/256	2 9/16	2 19/32	2 5/8	2 21/32
Bamboo Bag	15	2			1	2	7	2	1	
Bast	16	3			1	1	8	2	1	
Bamboo Bag	16				1	3	9	3		
Bamboo Bag	19	2			5	6	5	1		
Bamboo Bag	17									



Resistance of Lamps when cold Nov. 16
before current on them.

~~360~~	660
~~270~~	430
~~200~~	360
	2500
	775
	950
	2000
	2000
	2450
	1100
	870
	470
	390
	440
	900
	440

Set 1. Bast fibre 1 hour
carbonizing 1 hour
Oct. 16.

950	in flame one broken
700	700
700	670 after heating in gas flame
700	
690	
700	

Set 2 Bamboo under same conditions as Set 1 carbonized from the beginning

750
650
650
675
675
650

Lot 3

Lamps carbonized in regular way in 15 minutes and tested and found to be good

※1	700	Ohms
2	1070	
3	980	
4	1000	
5	625	
6	650	
7	1020	
8	760	
9	2450	✓
10	640	
11	525	✓
12	675	

Lot 3

#	
13	740
14	950
15	450 ✓
16	1250 ✓
17	750
18	1150
19	1050
20	670
21	900
22	680
23	580
24	610
25	600
26	950
27	750
28	780
29	650
30	900

Jan. 15

Exp. When carbon heated
gas flame resistance
increased

Pt drops	705	Thus
Pt "	765	

Warmed in gas flame
10 to 15 ohms less

Bast fiber

Marked 675 cold

marked 680 cold

Reg 1 3
900 – 710 – 500

Test of 7 Bast fibres thick ends 35
Carbonized slowly 3 hours

560
460
500
510
460
460
510

Old hot.

No			
1	670 ohms	24	860
2	[illegible]	25	470
3	[illegible]	26	520
4	727	27	770
5	1100	28	775
6	770	29	775
7	1010		
8	660	30	480
9	770	31	550
10	770	32	520
11	750	33	1000
12	1150	34	800
13	1100	35	577
14	910	36	420
15	910	37	2700
16	570	38	650
17	620	39	470
18	950		
19	800	40	590
20	750	41	950
21	975	42	627
22	570	43	580
23	810	44	453
		45	2500

~~Length~~

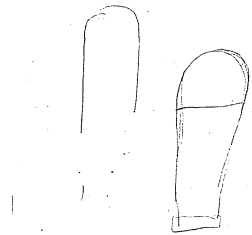
Experiment on 10 bamboo

Contrasted the old way
o of the hot shot to
taken from Elements
Weights [illegible]
o Dr Moore

1. 1027 ✓
2. 970 ✓
3. 1100 ✓
4. 360
5. 975
6. 2000 ✓
7. 510
8. 975
9. 650
10. 1400 ✓

Carbonization of 10 bamboo
1 hours - taking 6 of
the lowest [illegible]
[illegible]
[illegible]

1. 550
2. 600-v
3. 710
4. [illegible]
5. 660-v
6. [illegible]
7. 750
8. 650-v
9. 570-v
10. [illegible]



November 14, 1880

Tag

Charlottesville

Vacuum by heating carbonized material and carbon in ~~[illegible]~~ bulb stop-cock at each end of carbon bulb — one end open on other end lamp. Heat the carbon bulb with open end close end stop-cock and open on leading to lamp

Variations in resistance before & after placing on pumpcoil.

Before 345 } 161
After 184 }

D. — 508 } 317
D. — 191 }

445 } 278
167 }

491 } 309
182 }

455 } 238
217 }

508 } 306
202 }

466 } 251
175 }

167
184
191
189
175
202
217

Nov. 17th 1880.

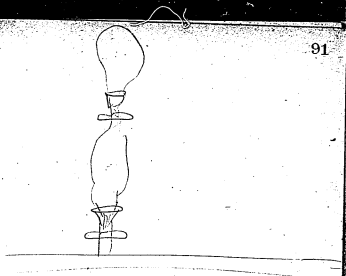
Experiment to determine difference in weight between high & low resistance:—

6 Bamboo cars old way, high test
Wt. = ,0317 Gr. = 31 7/10 Milligrammes

6 Bamboo Cars one turn low resistance
Wt. ,0344 Gr. = 34 Milligrammes

The above were selected from out of ten of each class, being the six (6) highest & 6 lowest resistance of their respective lots.—

Alex. Welch



Resistances compared with lamp

500	365 Ohms
505	357.5
510	350.5
525	330
549 1/4	300
595	250
649	200
713 3/4	150

493	375
476 1/4	400
446 1/2	450
420 1/2	500
397	~~600~~ 550
376	600
340	700
263	1000
330	730

16.7 : 16.7

18) 25 (14 candles
18
70

12.2
12.2
244
122
1166.4

18
18
144
18
324
1166.4
9466 (21
4
41) 40

3738 14 candles
3907 16 candles

10.8
18.
288
9.6
19.2

21
19.2
1.8

25
4.3
16.7

17
17
119
17
289
64
353 (18.7
28) 253
224
36) 2900

14.5581
21.311

3907) 38000 (8.44
31248
17520
15628
18920

7) 3738
534
4272) 33000 (7.7
29934
32660

Lamps

6" X .017 X .008

Average 16.7/1000

Diameter 18.7/1000 2.

6" X .017 X .0128

Average 19.2/1000

Diameter 21./1000 1.8

.012.5 X .012.5 X 6"

Average 16.7/1000

Diameter 17.6/1000 .9

Lamps .17

8

$\sqrt{17^2 \; 8^2} = \sqrt{353} = 18.7$

$\sqrt{18 + 10.8} = \sqrt{440.6} = 21$

$\frac{2}{3} \times 28.8 = 19.2$

16.7 : 18.7

12.5

12.5

156.25

312.5

16.7 average

17.6 Diameter

?

2 - 36 - 25
2 34 10
2 - 15
120
15
135

2 - 38
36 55
1 5
65
2 - 40 - 15
39 40
1 35
195
47

Pump 2

2 - 33 - 40 Spark stops

2 - 34 - 10 10 seconds of current

2 - 36 - 25 spark off

2 - 36 - 55 10 seconds of current

2 - 38 ——— 8

2 - 39 - 40 20 seconds

2 - 40 - 15

43 - 25
41 - 40
1 45
105
52

2 — 41 — 40 20 seconds
2 - 43 - 25 20
2 45 - 30 20
2 — 46 30 sec
2 - 47 20.
2 - 48 - 20 30 sec
2 - 50 - 20
2 - 50 - 30 1 minute
2 - 53 - 45 20

Nov. 21st/80.

Experiment made to determine whether length of carbon in any way affected resistance.

Length	2 7/16	– 2 15/32	– 2 1/2	– 2 5/32	– 2 3/16	– 2 13/32
	462	443	620	710	670	365
	330	484	585	658	512	
	661	395	390	613	500	
		454	457	730		
		453	547	730		
		387	645	478		
		513	595	374		
		330	555	657		
			575	534		
			545			
	1453	3449	5551	5449	1682	365
G. Ave	484 1/3	434 7/8	551 7/9	608 1/9	560 2/3	365

Alex. Holden

Nov 22nd 1880

Carbon loops

From this date we call the "regular loop" a Best fibre cut 10 X 14 thousandths. Put on lamps of this kind "Regular" "Date" and Resistance

can 5 hour

Chas. Batchelor

11/26/80.

" Fire @ hour Back low to regular

- 397 - Back
.420 out
.443 out
337 back.
.440 out
1. .357
.433 out
474 out
1 .372 Back
446 out

Lot 8 17

3 Bamboo 3 hr.
1200 over
1200 "
1200 "
1200 "

4 Bamboo 4 hr.
1200 over
" "

Back "Regular"

1 .375
.376
.398
.395
1. 348 Val. Scaled in
454 out
1 .377

4 #1 Bamboo one @ hour heat very clean
1200 over
1200 "
1200 "
1200 "

2 Do 2 hr Do
1000 over
1000 "
1000 "

L.L. 372 Italian out of damper

Bark

Sur 14 – Cal'd 8½ hrs AW. 25/80.

606 Calcined 8½ hrs. – 7 hrs Bake R

661 heat 1 hr from Bal to Bright red

453 1½ hr from B.R. to green heat.

395 –

510 (Taken out)

481.

Nov. 26/80

Bamboo 10×17 5 Hours.

Bright red very strong

375

396

413

358 All sealed in and sent up to Daly

385

375

348

386

404

368

Alex. Nelson

Nov. 27/80.

Bark 10×17 – 5 hrs.

292

315

296

1 Paper 9×17 – 5 hrs

about 850 Sealed in and sent to Daly 11/29/80.

Sur of 19 "Regular" Bark

440

408

421 Taken out.

428

560

415

483

402

473

516

503

467

474

448

455

11/29/80.

Lot #3 – Basswood 10x17 Having no suitable frame 5 hr. Cat2. for further opening see Van Cleef's Book p. 29.

Resistance
·285
·266
·260
·251
·289
·300
·307
·272
·257
·300

Dr. Board

Alex. Welch

Lot #2 #0 11/29/80

Bass 10x17 – 5 hrs. (See Book (Bradley's) p. 28)

Resistance – 268. 289. 262. 317. 317. 335. 307. 325. 314. 311. 325. 289. 254. 307. 293. 287. 278.

Re-illumed

To be kept separately.

Alex. Welch

Lot #12 11/29/80.

#1 Solid Bamboo Cane (new stock) 8x17 – 5 hrs (See Bradley's Book p. 2)

Resistance – 344. 335. 324. 324. 336. 319. 312.

drawn plan

Alex. Welch

Lot #1 – 5 hours #2 11/30/80

Basswood (See Bradley's book p. 27)

Resistance – 290. 277. 250. 280. 288.

Alex. Welch

Lot #3 – #3 11/30/80

Aspen 9x17 (See Bradley's book p. 31)

745. 750. 697. 805. 720. 820. 702. 632. 761. 761

Alex. Welch

11/30/80

Lot #13 Bamboo 8X17 — cut from new stock. peculiar kind of Bamboo (See Bradley's book (p. 33)

This stock looks very good — 11 fibres

Resistances:— 377. 347. 352. 395. 382. 336. 359. 337.

Alex Nelson

Lot of 19 — 11/30/80

Bamboo 8X17 — fibre regular

Resistances:— 377. 350. 508. 380. 359. 383. 397. 346. 335. 390. 378. 346. 340. 383. 353.

Alex Nelson

11/30/80

Lot of 18 — Bamboo 8X17 — fibre regular

Resistances:— 457. 445. 438. 456. 404. 439. 485. 405. 492. 481. 481. 447. 435. 435. 493. 457.

Alex Nelson

#14 — 13 Pcs 12/1/80.

Lot of 16 Bamboo 8X17 — fibre.

Resis: 289. 278. 312. 292. 289. 294. 301. 276. 285. 300. 286. 276. 296. — OK.

13 Alex Nelson

Dec 1st 1880

The lamps made for Laboratory from this date will be Bamboo — 8X17 thousandths — 5 hours carbonization — and will be numbered consecutively commencing at 1. All will be under 400 ohms resistance when cold — Platinum Clamps.

Chas Batchelor

#5 Dec 1st 1880 12/1/80.

Bamboo 8×17 – 5 tiers.

Resis.s 290. 267. 280. 294. 261. 289. 275. 297. 313. 320. 307. 282. 309. 283. 272. 284.

Dom. stains

Alex. Nicol

Lot 18 – 15 fibres Dec 1st 1880 12/1/80.

#6 Bamboo one half size of original fibre ⊏⊐ made from the heart of the "Salt" Bamboo (See Bradley p. 37)

110. 164. 125. 85. 194. 125. 138. 126. 110. (See p. 129.)

Dec 1st 12/1/80

#7. "Tapes." 5 – Bamboo 8×17 small pieces cut of each 1/8 in away from the beginning of the round 1/4 in long reducing away to ⅛ in

See Bradley's book p. 37

Resis = 358. 350. "Scarlet in and sent to Lots"

Alex. Nicol

Dec 1st 12/1/80

#8 5 – 3 mo

5 Bamboo 1/1000 Thick Tapering Tiers (See Brad. p. 39 Bafing)

Resis :– 309. 305. 313. 305. 318 (Sent to Lots)

Alex. Nicol

12/2/80

1 Bamboo 8×17 5 ft 7 in.

Recei: 283. 295. 325. 257. 284. 360. 290.
296. 285. 281. 291. 295. 272. 260. 296

Alex. Welch

Dec. 2d 1880.

Tart Bamboo 8/1000 thick (Tapered) as follows

Reis:- 264. 270.

(Dat 12/2/80.)

Alex. Welch

Dec. 2d 1880.

2 Bamboos from stock same as last lot of same size 8/1000 thick

Tapered thus:

Reistanced: 287. 289. 325.

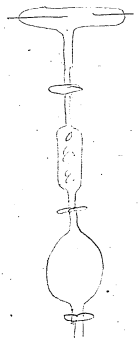
Alex. Welch

Dec. 3d 1880.

Bamboo 8×17 - 35/1000 thick & 62½/1000 wide on under from best of last lot - regular length. There is out of them 4/1000 wanting on any end.

Reis: 409. 305 267. 261. 261.

— See p. 125 —



Order

Make a mould full Reg Bamboo & hour req heat.

also mould full. same using Iron mould and going up to safe final temperature.

The carbons are to be numbered or capped. Nickel Mould Reg and Iron Mould Reg

They are to be tested for Resistance & put in lamps. & Res marked on each lamp

afterwards they are to have their Res measured at 16 Candles to determine if the heat attained ~~to determine if the heat attained~~ with Iron Mould ~~is sufficient~~ with both the final Res at 16 C of both shows The Res measure of Iron higher than its Nickel.

Bundle fibre, that is the portion of wool operatively selected to spin out whether the dark stained or white, & the wool being mostly the part in intimate to the fibre for carrying purposes

(See Reading Book, p. 40)

1st — 254. 258. 240. 289. 252. 266. 276. 264. 270. 260.

2nd — 240. 246. 253. Cut Ave. 253 13/13

2d 272. 255. 253. 270. 267. 270. 263. 261. 256. 245. 259. 244. 255/266. Cut Ave. 262 1/2

Wm. Dodd

Dec. 7th 80.

Lot No. 1 Bundle fibre 10 oz. (See Book Reading, p. 30)

Results 292. 292. 280.

Wm. Dodd

Dec. 7th 80

Lot No. 2 Bundle 10 oz. (See Reading, p. 28)

Results: 285. 291. 265. 299. 265. 276. Cut Ave. 276

Wm. Dodd

Dec. 5th 80.

Brantes 8xiv "Recently selected from the best or the best is to be called the "Brantes"

Quer:— "To determine whether there is any difference between the so called worst & the special best stock".

"Would like to know all about this at the earliest possible moment"? See Bailey's Hk p. 41

"Cream color new item supposed to be the best"

For reply Tuesday Dec. p. 183.—

Geo. Peck

Dec. 5th 80.—

Brantes 8xiv outgrow new Ethel & Pearl marketing early — See Bailey's book p. 16

Orders 270. 26th. 272. 256. 276. 26th. 253. 256. 280. V.H. 265th.

Geo. Peck

Dec. 8. '80.

Bambra 2 sizes (continued p. 117)
Lot recd. this day Qeiv:- 195.185.165.18L.
17L.165.— C.A. 178. Ali Dolah

Dec. 6/80.

Bambra 2 sizes (continued above)
Qeiv: 3 10L. 118.110.10L.118.110.10L 10 1 —
C.A. 108/8. Ali Dolah

Dec. 7. 1880 —

Special lot. Cosmiano (continued p. 127)
Qeiv: 256.211.221.236.212.218.222.222
224.248.213.224.223.236.231.
236.236.227.209.230.236.222.
C.A. 22 2/22 Ali Dolah.

Dec. 12/80

Recd of Mr. Edwards Friends
r (1) Regular 2 in R. 70
1 " 1/2 " 60

Ali Dolah

Dec. 8th 1880

I did not use any carbons, because they were 300 ohms resistance as directed by Mr. Edison Watching this day —

Alex. Orlich

Dec. 9th 1880.

Directed by Mr. Edison to take out all bad carbons from inside parts as he does not want any.

Alex. Orlich

Dep. 0 Rto.

Paulus 4 17 December (Dep. 127)

Reich

256	267	325
280	234	285
327	212	286
277	205	255
315	267	305
288	239	286
274	307	315
308	231	331
300	272	331
265	247	2719
200	278	
250	381	Total 8161
272	270	8050
280	200	2719
218	211	
270	293	6 / 18930 / 282 36/67 G
288	286	
230	327	Hr. Reich
292	319	
252	248	
272	240	
270	312	
275	372	
265	248	
248	288	
272	288	
232	356	
236	295	
289	365	
226	312	
8161	8050	

12/15/80

From this day all regular cartons are to be distinguished as follows. 9. 13 C D
6m- 3- 2. 1½ by direction
J M. Batchelor
Alex Welsh

Jan. 4th '81.

Bambos "Reg" ½ egg treated with Carbolic under cover of bar. (3 fm. heat)
Reir.' 756. 754. 754. 460. 245. 245. 245
218. 218. 218. 190.
Alex. Welsh

" Jan. 1. '81.

Reir. of Bambos "Regulars" cartons in Actual
566. 675. 570. 384. 390. 589. 589. 730. 604
604. 685. 628. 760. 760. 368. 441. 417.
377. 412. 369. 510 } 635.
Alex. Welsh

Jan. 1/81.

A "Regular" carbon for the present is a fibre carbonized for 3 hours without stop of Bamboo 8x17.

Alex. Welch

Jan. 5/81

Patinized boards.

Resis.s 570. 875. 640. 690

Alex. Welch

"A"

Jan. 5/81.

Bamboo 8x17. 3 hrs. heat. Treated with carbolic acid under cover of iron box. Nine minutes stop.

Resis.s 570. 580. 510. 426. 430. 426. 445. 443. 570. 525. 443. 500. 500 & 800.

Alex Welch

Jan. 5/81.

Bamboo "A" treated with acetic regular heat 3 hrs. no stop.

Resis.s 335. 375. 261. 261. 260. 268. 267. 265. 260. 267. 294. 245. 289

Alex. Welch

Jan. 6/81

Reg. "B" Carbons treated with carbolic acid in brass cover of iron pot —
Resis: 7.56. 7.54. 7.54. 2.45. 7.45. 2.45. 2.18. 2.18. 7.18. 7.90. —

Alex. Welch

1/7/81 —

No. 6 — Shellac on Lawson
2 Reg. "A" 4.55. 8x17 — Resis under 300 —

Alex Welch

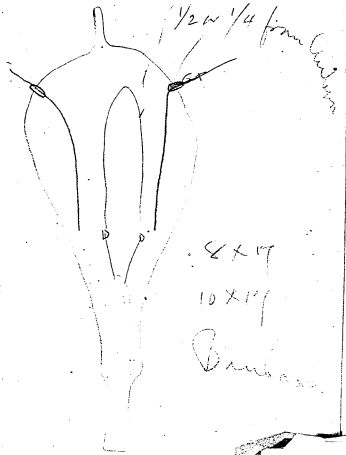
1/8/81. —

1. 4 New style clamper. Carbonizing. Resis 300.
1/4/81. 3 P.M. placed in circuit
1/7/81. 10 P.M. Taken out. A.K.

2 3 Do. —
1/9/81. Placed in solution 11:30 am " " " 300
1/10/81 Taken out 9- 1/8/81. Alex Welch

Experiments in clamping platina wires to carbon by means of electric deposition. The leading wires the leading wires as far as the carbon tips ought to be cleaned by means of heat before being sealed in lamps

Alex Welch


1/2 w 1/4 from
8 x 17
10 x 17

Lot # 8 1/18/81.

New style clamping.

1/16/81. Placed in solution 8 P.M.

1/17/81. Taken out 1:30 P.M.

Chas Oldch

Lot # 4 – 1 Spiral Cu 1/18/81.

" 5 – 7 B's Ag.

Alex Oldch

1/19/81.

Lot # 6 – 4 "B's" Cu Bk. 1 p. 11

7 – 1 – Spiral "G" " " 1 " (20)

9 – 1 – " " " " 1 " (20)

8 – (6) "B". Ag. } Cu } " 1 p. 12

1/19/81. All new style clamping to be heated at about 175° F. 1/2 hour to dry same. Sawyer

2 A.g. Plat.d Looped R. 1/19/81

See Lawson's book p3

1/20/81.

11 1 Spiral Cu. Bk. 1 p. 12

1/20/81.

12 – 5 B. Ag

13 – 4 " Cu } Bk. 1 p. 13

Order No. 46 — 12 - Car. R. 1/19/81. 299.334.312.300.
299.289.283.285.305
283.325 - NO. 303 ½

" " 105 - 5 Car. R. 337.328.323.325.278

" No. 45 - 10 Car. R. 267.254.233.262.293.290
278.282.296.299.

" " 107 - 8 Car. R. 426.429.469.462.500

1/12/81 " No. 43.7 Car "A" R. 302.267.296.274.289.299
267

" " 115.8 Car "A" R. 334.350.350-325-365
340.352.337

" " 123 11 " "A" R. 295-312-312-300
295-290-315-310
305-300-305

" " 44.13 " "A" R. 300-310-290-280
275-270-285-295
280-285-275-300
295.

1/22/81

" " 124.15 " "A" R. 245-290-250-255
285-245-250-225
275-255-240-230.
260-275-280

" " 125 5 " A. R. 350.330.355.360.350

" " 120 1 " "A" R. 480

" " 139 7 " A. R. 175-182-230-210-185
190-210

1/22/81 in double clamp
Order No 117- 4 bar R 120-125-120-120.
1/24/81
Order No " 126-3 bar R 300-285-290
" " " 127- 2 bar R 410-480.
" " " 44- 6 bar R 290-230-250-280
245-275.
" " " 47- 5 bar R 235-225-210-225-
225
" " " 48- 8 bar R 270-275-300-270
280-290-285-275-
1/25/81
Order No 128-9 bar R 260-255-250-255-
270-B/25-120-120-130
" " 32-13 bar R 315-310-275-280
295-260-270-290-290
290-295-280-290.
" " 126-2 bar R 290-256
" " 32-14 bar R 275-265-315-290
285-290-295-295-310
295-290-280-285-285
" " 131-5 bar R 405-385-370-380-375
" " 133-6 bar R 340-325-310-230
300-295

1/25/81
Order No 133-14 bar R
565-520-525-670
730-735-700-725
590-590-565-600
590-620.
Order No 138 6 bar R
300-295-285-290
315-300.
" " 137 4 bar R
310-360-340-345
1/26/81
" " 139 6 bar R 410-420-400-450-440-415
" " 143 5 bar R 410-420-390-375-410
" " 144 5 bar R 310-340-305-330-290
" " 144 13 bar R 270-290-250-270
260-295-230-275
290-285-225-240
230.
1/27/81
" " 132-15 bar R 220-208-245-210-220
1/28/81
255-210-270-250-210
230-250-270-245-270.
" " 153 bar R 120-125-115-120-135-125-
135-120-115-120-130-120-115
145-125-120-125-135-120-115
125-120-130-110-130-125-115
110-130-120-120-115-125

1/31/81

Order No 140 R 12a
245-255-230-235-270
250-260-255-240-270
260-250.

Order No 141 R 6a
245-240-245-240
245-240.

Order No 39 R 10a
295-290-310-325-285
296-326-305-325-335

Order No 40 R 13a
380-350-315-310-325-320
310-340-325-330-345-360
345.

Order No 145 R 12a
325-300

Order No 141 R 7a
285-300-295-285-295-295
280

Order No 133 R 12a
250-270-260-255-250
220-235-240-260-270
240-270.

Feb-1/81

Order No 37 12 bar
200-200-230-235-200
225-230-205-200-230
205-195

Feb-1/81

Order No 156-9 bar
375-380-390-350-365
410-340-385-400

" " 146-10 bar
265-280-280-260-270
275-280-275-265-290

" " 133-13 bar
168-175-170-195-180-180
170-225-195-205-185-180
215

Feb-2/81

Order No 166-3 bar R
155-150-150-175-155-155
150-170-150-150-160-165-150
170-145-162-130-135-132-165
170-165-160-165-160-168-175
165-175-165-150-160-155-165
140-145

" " 166 26 bar R
195-170-185-180-175-170
165-160-175-165-190-180
175-155-170-165-150-165
175-175-160-195-170-180
165-150.

" " 156 13A bar R
545-520-445-550-445
570-410-575-445-470
570-490-475

" " 156 17A bar R
450-520-545-440-550-500
500-520-542-420-445-420
360-400-475

" " 35 13A bar R
350-345-360-210-190
335-315-325-325-340
315-315-325

Feb 2/81

Order No 35 5A. R
265-245-235-230-215

" " 33 11A R
240-235-245-220-195-210
235-195-235-215-230

" " 33 11A R
195-205-200-205-195
225-195-210-180-195
190

Feb 3/81

Order No 36 12A bar
255-240-250-245-240
230-245-245-230-220
240-245

" " 33 9A bar
205-205-200-200-210
205-200-205-200

" " 35 7A bar
325-315-330-325-335
310-305

" " 192 11A bar
200-210-205-200
210-195-195-205
200-215-205.

" " 39 10 bar
225-230-240-235
205-245-245-225
210-255-192.

" " 192 4 bar
210 215-195-200

Feb 3/81

Order No 39 R 2 bar
270-275

" " 40 13 bar R
235-220-240-230-249
230-230-225-230-245
235-230-220.

" " 33 4 bar R
215-190-225-220

" " 39 7 bar R
248-245-195-256-245
240-245

" " 192 5 bar R
205-200-236-205-205

" " 192 20 bar R
350-350-350-355-340
350-365-345-385-360
350-355-365-345-360
355-340-365-350-355

" " 192 16 bar R
300-305-320-345-350
325-320-315-330-340
330-325-340-345-360
355

Feb 7/81

" " 198 R 15 bar
540-612-580-560-600-585-550-470
565-550-645-590-560-575-555

" " 192 R 15 bar
670-700-1000-520-650-625-650-710
685-670-1000-950-700-650-850.

" " 192 R 16 bar
280-260-245-255-730-295
260-285-265-250-260-290
280-267-260-280.

Feb 7/81

Order No 19817 bear R

600-580-570-575-560
565-575-550-560-580
710-720-705-730-680
670-670

" " 19814 bear R

395-380-800-430-450-445
435-730-430-460-550
575-560-576.

" " 19814 bear R

650-370-410-500-420
460-475-550-570-585
610-630-620-605

Total Amt of various letters 711.

March 24. 1881,

Cost Pt. wires

1 lb 3 doz cost $ 94.94
Express charge 7.80
$102.74

It made 12,000)102.74

2 ~~(12000)~~ 6000) 102.74 (1

1.7 cts per lamp

J R Upton.

Nov 27, 1880

Tested No 1 Bamboo carbon in Iron clamp, and afterward in Platinum clamp and found no difference in resistance.

Tested No 1 Bamboo carbon in Nickel clamp, and afterward in Iridium clamp and found no difference in resist.

We find that bamboo have been tested and allowed to stand a few days always test higher. The difference in resist we think is the result of platinum & iridium action on carbon

W. A. Mills

1/24/51

Order

135 Lamps with platinum clamps and plated carbons.

136 Lamps with platinum clamps and unplated carbons.

158 Lamps with silver clamps and unplated carbons

Lat of 17 Aquilarei

Resistance of in full of different Lots of

Lot No	1			2			3		
Day	12			12			12		
	Fold	Hot	Remarks	Cold	Hot	Remarks			
	249			377			341		
	319			354			402		
	285			297			418		
	332			315			288		
	294			336			300		
	293			414			304		
	291			366			389		
	377			391			218		
	336			372			259		
	254			376			293		
	282			273			331		
	292			378			251		
	303			296			305		
	340	300 "		382	349 "		309		
							216		
							236		
							208	2 35 "	

1881.

Lot No	1			2			3			Lot of 29					
Jany 12															
	Cold Not	Remarks													
	249			377			341			329			314		
	319			354			402			285			365		
	285			297			418			267			329	331 1/2	
	332			315			283			302					
	294			336			300			343					
	223			414			304			336					
	291			366			329			329					
	377			391			218			344					
	336			372			259			303					
	254			376			293			350					
	282			373			331			360					
	292			378			287			363					
	303			296			306			336					
	340	340 1/2		382			209			343					
				312	349 15/16		216			311					
							236			362					
							209		355 11/16	303					
										394					
										390					
										359					
										302					

4	5	6	7	8
207	270	311	232	251
241	327	297	246	305
260	302	257	220	339
245	322	293	213	206
196	209	283	213	233
257	260	281	209	253
261	329	280	227	245
211	248	240	219	277
234	276	264	291	299
203	293	262	234	297
251	322	319	245	244
217	305	246	212	249
205	349	265	241	232
207		294	208	276
240		268	205	287
201		278	240	277
				233
				253

9	10	11	Mis: lot	12
243	255	278	289	232
272	270	305	291	316
289	288	331	270	245
240	259	329	267	245
292	331	397	289	227
309	240	365	267	268
262	250	304	256	223
295	267	349	221	268
238	323	326	267	229
295	261	336		259
249	244	324		239
264	267	310		244
336	223	317		260
291	251	339		259
265	250	299		259
348	242			220
260	275			246
	288			236
				248

13	14	15	16	17
232	289	261	224	358
241	260	225	268	357
232	277	226	276	343
263	239	267	261	403
223	277	199	235	362
257	257	257	255	381
245	242	263	265	374
280	234	264	257	338
236	241	250	257	491
254	219	224	264	327
312	223	207	240	420
346	236	196	243	427
267		294	247	360
			260	420
			243	

18	19	20	Total 21 Qs	21
344	316	350	535	331
327	311	308	635	378
327	327	377	635	306
339	366	393	790	343
385	367	418	248	346
346	369	359	724	392
342	358	374	764	337
361		416	236	365
310		409	705	373
405		463	658	388
296		337	775	280
388		398	690	360
423		391	234	395
297		395	766	371
334		360	357	376
283		350	379	392
			615	
			207	
			514	
			251	

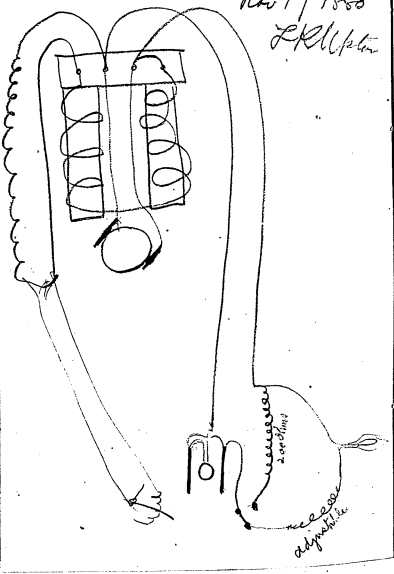
22	23	24	25	26
335	294	441	280	326
329	304	383	296	312
300	279	387	250	318
336	304	362	298	332
369	317	387	258	426
403	315	481	279	310
337	312	481	249	291
344	323	434	248	310
330	283	464	325	260
299	317	320	301	365
350	309	372	278	335
337	316	380	280	335
294	303	418	243	293
291		428	248	311
		431	267	295
				266

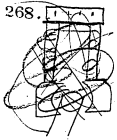
27			28			29			30			31		
436			443			358			270			241		
417			376			261			274			251		
381			408			262			299			252		
384			284			237			256			227		
411			393			363			272			256		
339			410			236			222			236		
381			248			261			236			215		
376			405			234			267			223		
380			435			214			254			227		
365			390			362			244			234		
510			491			206			259			227		235
382			373			249			271					
363			431			245			256					
443			443			242		239 ½	232					
360			349		391				264					
639		352	372						297		219 ½			
									232					

32	33	34	1(a)	5
218	380	325	299	214
215	230	244	300	223
232	242	331	286	211
191	209	252	320	222
236	267	265	323	206
233	256	260	299	209
238	278	294	289	218
209	261	332	312	241
264	213	241		216
198	256	261		216
278	289	248		200
209	227	319		230
	241	282		200
	236	246		202
		289		209
		273		218
		234		218
				210

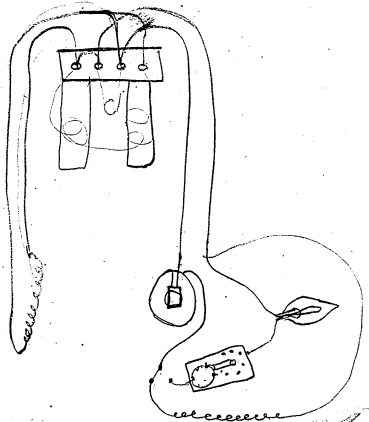
6			7		
349			306		
227			278		
245			272		
218			290		
210			269		
230			299		
264			261		
200			265		
223			288		
238			289		
288			277		
263			270		
209			267		
245			231		
225			258		
264			278		

Nov 17 1880
L R Upton





Nov 17 1880
A. H. Upham



1027
863

~~127~~

117

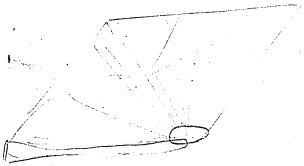
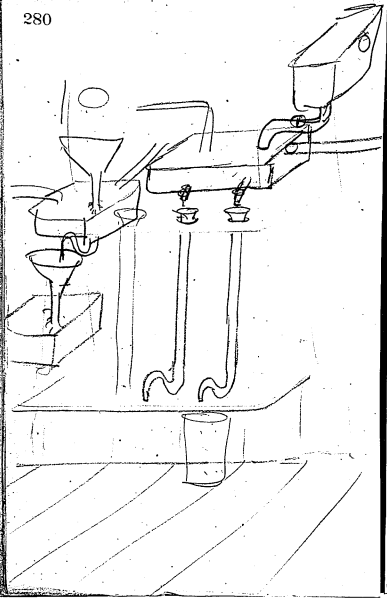
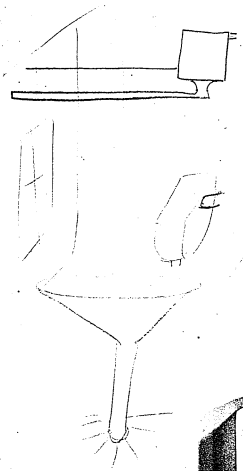
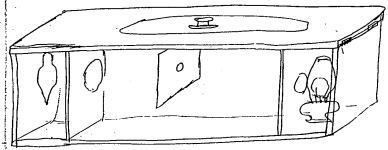
117
1024

117 : 882 : 100 : X

117 8830 754
819
640
565

1027
863

550

117 : 882 : 10 :

117 8830 7
819
640
565